UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JUN 4 2014

OFFICE OF
SOLID WASTE AND
EMERGENCY RESPONSE

Mr. Timothy Kasmoch
N-Viro International Corporation
2254 Centennial Road
Toledo, Ohio 43617

Dear Mr. Kasmoch:

In your letter of January 18, 2013, you request confirmation from the U.S. Environmental Protection Agency (EPA) that N-Viro International's N-Viro Fuel® is a non-waste fuel when burned in combustion units in accordance with the requirements in 40 CFR part 241.3(b)(4). To be designated as a non-waste fuel under that section, the rule requires that discarded non-hazardous secondary material (NHSM) undergo processing as defined in 40 CFR 241.2. Also, after processing, the NHSM must meet the legitimacy criteria for fuels in 40 CFR 241.3(d)(1). Based on the information provided in your letter, and follow-up correspondence and conference calls, we believe the N-Viro Fuel® produced by N-Viro International and burned in coal-fired combustion units for energy recovery would constitute a non-waste fuel under 40 CFR part 241 when substituting for 20% or less of the coal fuel required to operate the combustion unit. The remainder of this letter provides the basis for our position. *If there is a discrepancy in the information provided to us, it could result in a different interpretation.*

A non-waste determination under 40 CFR Part 241 does not preempt a state's authority to regulate a non-hazardous secondary material as a solid waste. Non-hazardous secondary materials may be regulated simultaneously as a solid waste by the state, but as a non-waste fuel under 40 CFR Part 241 for the purposes of determining the applicable emissions standards under the Clean Air Act for the combustion unit in which it is used.

## Processing

Processing is defined in 40 CFR 241.2 as operations that transform discarded NHSM into a non-waste fuel or non-waste ingredient, including operations necessary to: remove or destroy contaminants; significantly improve the fuel characteristics (e.g., sizing or drying of the material, in combination with other operations); chemically improve the as-fired energy content; or improve the ingredient characteristics. Minimal operations that result only in modifying the size of the material by shredding do not constitute processing for the purposes of the definition.

The determination of whether a particular operation or set of operations constitutes sufficient processing to meet the definition in 40 CFR 241.2 is necessarily a case-specific and fact-specific determination. This determination applies the regulatory definition of processing to the specific discarded material(s) being processed, as described in correspondence and supporting materials, taking into account the nature and content of the discarded material, as well as the types and extent of the operations performed on it. Thus, the same operations may or may not constitute sufficient processing under the regulation in a particular circumstance, depending on the material being processed and the specific facts of the processing. In some cases, certain operations will be sufficient to "transform discarded non-hazardous secondary material into a non-waste fuel," and in other cases, the same operations may not be sufficient to do so.

In your letter, in a subsequent email dated May 3, 2013, and follow-up conference calls,[1] you state that N-Viro International processes various blends of biosolids from multiple waste water treatment facilities to produce N-Viro Fuel®.[2] Specifically, you indicate that the biosolids are first screened for debris (i.e., inorganic grit and plastics) and dewatered prior to arrival at your facility.[3] After receipt and inspection of the material at the facility, any additional debris (i.e., plastics, large solids) still remaining will be removed by facility personnel. The dewatered biosolids are then mechanically mixed in measured amounts with materials, referred to as "Admixtures," (e.g., fly ash, cement kiln dust, lime kiln dust, or lime),[4] which react with the moisture in the dewatered biosolids to elevate the pH and generate heat for disinfection purposes.[5] In addition, material exiting the drier—finished product— is reintroduced during the mixing phase as a recycle function in order to reduce the particle size and increase the total percent solid, as well as boost the organic content and fuel value of the N-Viro Fuel®. After thoroughly mixing the biosolids and "Admixtures," the blend is then conveyed through a single pass rotary drum dryer. The dryer thermally evaporates water to help raise the overall heating value of the product fuel as well as other contaminants, such as nitrogen and sulfur that are contained in the biosolids.[6]

According to the information you provided, as the blend exits the rotary drum dryer, the blend then enters a multi-stage cyclonic separation system. The mixing and drying process eliminates large or oversize particles, while the cyclone separation system separates the desired fuel into a size similar to pulverized coal. The smallest particles are removed by subsequent cyclones or a venturi scrubber designed to capture fines and return them to the mixer (as discussed above) for remixing to improve product uniformity. The remixing enhances the efficiency of the drying system, maximizes heating value while sending on the best sized material as finished product. Finished fuel will be screened and/or inspected to ensure no foreign debris is present. The final product, which is set to have a final solids

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[1] May 3, 2013 email from Bob Bohmer to George Faison and Mike Svizzero. Conference calls were held on May 3, 2013 and August 28, 2013.

[2] In the material provided to EPA, you indicate that animal manure may also be used as feedstock to produce N-Viro Fuel®. This letter only addresses N-Viro Fuel that is produced from biosolids.

[3] As noted in June 4, 2010 proposed NHSM rule, EPA does not consider dewatering, by itself, to meet our definition of adequate or sufficient processing. For example, dewatering sewage sludge would likely be required processing as part of normal waste management activities (*e.g.*, prior to landfilling, or prior to burning the sludge for disposal in an incinerator). As such, we do not view dewatering alone to be sufficient processing to convert discarded materials into non-waste fuel products.

[4] Approximately 2 to 10 percent of Admixture is used depending on the characteristics of the material and the admixture used.

[5] While pathogens are not included as a contaminant identified in 40 CFR Part 241, you indicate that this process would also create a material that meets or exceeds Class A under the 40 CFR part 503 regulations for pathogens.

[6] While not a factor in determining whether the material has been sufficiently processed, we note that air control equipment will treat exhaust air from the dryer in a multi-stage process. The treatment will remove particulates through cyclone separation, treat ammonia and amines in the first stage packed bed scrubber, and reduce hydrogen sulfides in the second stage packed bed scrubber. The process will also spray odor masking chemicals in the final containment area.

content of between 75 and 95 percent, is granular in appearance and has less volume and weight than the original biosolids.

Regarding the use of "Admixtures," you also state that the addition of "Admixtures" modifies the ignition profile of N-Viro Fuel® making it more compatible in the boiler than simply dried biosolids. As dried biosolids have a very low ignition temperature making their use in commercial power units problematic, you indicate that this patented process modifies the ignition profile of N-Viro Fuel® to more closely resemble the ignitability of coal. In addition, the presence of oxides of calcium in the "Admixtures" makes calcium hydroxide available for $SO_x$ reduction when the fuel is combusted.

Based on this description—that is, removal of contaminants (i.e., removal of plastics, reduction in heavy metals via grit removal, as well as other contaminants in the drier) and improvement of its fuel characteristics (i.e., removal of large solids and grit, removal of water to improve the as-fired energy content, addition of Admixtures to improve ignition, and sizing of the material to allow it to be handled and fed to the boiler "as is"), we believe the process used to produce N-Viro Fuel ® meets the definition of processing in 40 CFR 241.2, and thus, transforms the dewatered biosolids into a non-waste fuel provided it meets the legitimacy criteria.

As noted in your letter of January 13, 2013 and follow-up calls, tests to determine impacts on performance, emissions, and byproduct constituents were based on a 10% or 20% substitution of N-Viro Fuel® for the primary fuel for which it substitutes—coal. Accordingly, the determination that N-Viro Fuel® would constitute a non-waste fuel under 40 CFR part 241 is predicated on a substitution of N-Viro Fuel® of 20% or less of the coal fuel required for the combustion unit.

<u>Legitimacy Criteria</u>

Under 40 CFR 241.3(d)(1), the legitimacy criteria for fuels include: 1) management of the material as a valuable commodity based on the following factors—storage prior to use must not exceed reasonable time frames, and management of the material must be in a manner consistent with an analogous fuel, or where there is no analogous fuel, adequately contained to prevent releases to the environment; 2) the material must have a meaningful heating value and be used as a fuel in a combustion unit that recovers energy; and 3) the material must contain contaminants at levels comparable to or less than those in traditional fuels which the combustion unit is designed to burn.

***Manage As A Valuable Commodity***

Regarding the first criterion, N-Viro Fuel® is stored on-site in a temporary indoor curing area, silo or bunker so that the material is not exposed to the outside atmosphere. Within a short time (hours or days), the N-Viro Fuel® will be conveyed or trucked to the end user, making sure that such material is not exposed to the environment. Once received by the power plant, it will be blended with other solid fuels of similar consistency and BTU content in the Active Fuel Storage Building. The mixed fuel will then be processed and burned as fuel in a circulating fluidized bed boiler.

Based on this information, the N-Viro Fuel® is managed as a valuable commodity and storage does not exceed a "reasonable time frame" as discussed in the NHSM final rule (40 CFR 241.3(d)(1)(i)(A).[7,8]

### *Meaningful Heating Value and Used As A Fuel to Recover Energy*

Regarding the second legitimacy criterion, you indicate that the N-Viro Fuel® has an as-fired heating value of between 5,500 and 6,000 Btu/pound and will be used as a fuel in a combustion unit that recovers energy. As the Agency stated in the preamble to the NHSM final rule, NHSMs with an energy value greater than 5,000 Btu/lb, as fired, are considered to have a meaningful heating value (see 76 FR 15541, March 21, 2011). Thus, we believe that N-Viro International's N-Viro Fuel® meets the second legitimacy criterion.

### *Comparability of Contaminant Levels*

Regarding the third criterion on contaminant levels, your letter requests confirmation that the N-Viro Fuel® meets the contaminant legitimacy criterion when compared to coal, the traditional fuel for which the combustion unit is designed to burn. In the enclosure to your January 2013 letter, you compared contaminant data for N-Viro Fuel® to contaminant data for coal as outlined in the "Contaminant Concentrations in Traditional Fuels: Tables for Comparison."

A direct contaminant-to-contaminant comparison, based on the information provided in your enclosure, is presented in Table 1. As noted in footnote a, the table compares samples of both digested and undigested biosolids that have been processed into N-Viro Fuel®. Based on this comparison, all contaminants in N-Viro Fuel® are comparable to or lower than those contaminants in coal, with the exceptions of manganese and fluorine. One of seven reported manganese values was higher than typically found in coal, while two of five reported fluorine values were higher than typically found in coal.

The EPA previously stated that for the purposes of contaminant comparisons, it may be appropriate to group contaminants sharing similar physical and chemical properties that influence behavior in the combustion unit prior to the point where emissions occur. Although not included in the Agency's sample approach,[9] grouping of low-volatile metals and the total halogens chlorine and fluorine would be appropriate as contaminants within each of these groups share key physical and chemical properties and would be expected to behave similarly in a combustion unit prior to the point where emissions occur. For example, a significant portion of low-volatile metals can be expected to remain in the bottom ash after combustion relative to other contaminants. The halogens chlorine and fluorine are highly reactive and form acid gases when bonded with hydrogen in the combustion chamber. Nevertheless, there may be circumstances in which grouping of low-volatile metals and the total halogens chlorine and fluorine would not be appropriate and the EPA will evaluate each instance on a case-by-case basis.

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[7] As discussed in the NHSM final rule (76 FR 15520) ''reasonable time frame'' is not specifically defined as such time frames vary among the large number of non-hazardous secondary materials and industry involved.

[8] Regarding the management of N-Viro Fuel and the type of boiler design at the end user, the information provided addresses the Scrubgrass Generating Plant, an 80 megawatt waste coal plant located in Kennerdell, Pennsylvania. To the extent that the N-Viro Fuel is sent to another power plant, no information was provided as to how the N-Viro Fuel will be managed or the boiler technology used and thus, this letter does not address this aspect of the legitimacy criteria at other end users.

[9] See 78 FR 9146.

Enclosed, Table 2 provides grouping data for a comparison of low-volatile metals (including manganese), and Table 3 provides grouping data for a comparison of total halogens (including fluorine). The data show that, for each of the groups of contaminants, the range of the totals present in N-Viro Fuel® is within the range found in coal. This conclusion assumes that N-Viro Fuel® was tested for any constituents expected to be present. Additional constituents for which N-Viro Fuel® were not tested must, as is the case for those tested, be present at levels comparable to or less than those in coal, based on your knowledge of the material.

Conclusion

Overall, based on the information provided in your letter, we believe the facts indicate that N-Viro Fuel® meets both the processing definition and the legitimacy criteria outlined above. Accordingly, we would consider this NHSM a non-waste fuel under the 40 CFR Part 241 regulations when substituting for 20% or less of the coal fuel required to operate the combustion unit.

If you have any other questions, please contact George Faison of my staff at 703-305-7652.

Sincerely,

Betsy Devlin

Betsy Devlin, Director
Materials Recycling and Waste Management Division
Office of Resource Conservation and Recovery

Enclosures

cc: John Armstead
EPA Region III, Land and Chemicals Division

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Enclosure

# Table 1. Data Supplied by N-Viro International Corporation

| Contaminant | N-Viro Fuel® N-Viro Fuel® ® Contaminant Levels and Heating Value[a] | | | | | | | | | | Coal Range[b] | Comparison Results |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample 1 Undigested | Sample 1 Digested | Sample 2 Undigested | Sample 3 Digested | Sample 4 Digested | April 2011 Composite | April 2009 Composite | Feb 2012 Test A | Feb 2012 Test B | Max | | |
| **Metal Elements (ppm - dry basis)** | | | | | | | | | | | | |
| Antimony | <5.76 | <6.88 | <10.9 | <10.1 | <5.63 | | | | | <10.9[c] | ND - 10 | Comparable. Highest detection limits slightly above range. |
| Arsenic | <5.76 | <6.88 | 14.8 | 15.7 | <5.63 | 29.4 | <5 | | | 29.4 | ND - 174 | Within range. |
| Beryllium | 1.26 | 1.42 | <0.00820 | 0.534 | 1.46 | | <5 | | | 1.46[d] | ND - 206 | Within range. |
| Cadmium | 0.587 | 0.722 | 0.897 | 1.35 | 0.72 | 1.95 | <5 | | | 1.95[e] | ND - 19 | Within range. |
| Chromium | 16 | 19.3 | 12.9 | 47.9 | 17.9 | 23.5 | 30 | | | 47.9 | ND - 168 | Within range. |
| Cobalt | 4.38 | 4.53 | 3.27 | 4 | 4.41 | | | | | 4.53 | ND - 25.2 | Within range. |
| Lead | 8.66 | 8.55 | 18.2 | 62.3 | 10.5 | 46.3 | <5 | | | 62.3 | ND - 148 | Within range. |
| Manganese | 54.3 | 52.8 | 609 | 384 | 64 | 309 | 253 | | | 609 | ND - 512 | One sample higher than coal range. |
| Mercury | 0.3982 | 0.5577 | 0.7375 | 0.6761 | 0.3334 | 1.9 | 0.227 | | | 1.9 | ND - 3.1 | Within range. |
| Nickel | 14 | 16.7 | 14.4 | 24.3 | 16.1 | 32.1 | 110 | | | 110 | ND - 730 | Within range. |
| Selenium | 7.61 | 8.82 | <10.9 | <10.1 | 8.37 | 7.24 | <5 | | | 8.82[f] | ND - 74.3 | Within range. |
| **Non-metal Elements (ppm - dry basis)** | | | | | | | | | | | | |
| Chlorine | 6,740 | 7,551 | 2,728 | 2,329 | 5,002 | | 3,542 | | | 7,551 | ND - 9,080 | Within range. |
| Fluorine | 130.5 | 177 | 483.6 | 159.7 | 390.8 | | | | | 483.6 | ND - 178 | Two samples higher than coal range. |
| Nitrogen | 32,250 | 33,340 | 36,850 | 34,380 | 28,980 | 22,054 | | | | 36,850 | 13,600 - 54,000 | Within range. |
| Sulfur | 13,900 | 13,000 | 13,800 | 14,700 | 14,500 | 22,530 | | | | 22,530 | 740 - 61,300 | Within range. |
| **Volatile Organic Compounds (VOC) (µg/kg)** | | | | | | | | | | | | |
| Benzene | <55.3 | <54.3 | <4.86 | <5.41 | <47.9 | | | | | <55.3[c] | ND - 38,000 | Within range. |
| Ethylbenzene | <55.3 | <54.3 | <4.86 | <5.41 | <47.9 | | | | | <55.3[c] | 700 - 5,400 | Lower than coal range. |
| Styrene | <55.3 | <54.3 | <4.86 | <5.41 | <47.9 | | | | | <55.3[c] | 1,000 - 26,000 | Lower than coal range. |
| Toluene | <55.3 | <54.3 | 13.9 | 29.4 | <47.9 | | | | | 29.4[g] | 8,600 - 56,000 | Lower than coal range. |
| Xylenes | <55.3 | <54.3 | 4.92 | 16.1 | <47.9 | | | | | 16.1[g] | 4,000 - 28,000 | Lower than coal range. |
| **Heating Value** | | | | | | | | | | | | |
| BTU/lb | 5,580 | 4,510 | 5,260 | 4,870 | 4,350 | | 5,017 | 6,099 | 6,097 | | | |

**Notes:**

a. Data provided by N-Viro International Corporation on January 18, 2013. Samples include both digested sludges (sludges that have undergone anaerobic digestion) and undigested sludge.

b. Ranges for Coal from a combination of EPA data and literature sources, as presented in EPA document *Contaminant Concentrations in Traditional Fuels: Tables for Comparison, November 29, 2011,* available at www.epa.gov/epawaste/nonhaz/define/index.htm.

c. All samples were below detection limits, so the actual value (if known) would be less than 10.9 ppm and would be comparable to the range of coal.

d. Highest detection limit was 5 ppm.

e. Detection limit was 5 ppm.

f. Highest detection limit was 10.9 ppm, but the sample was below the detection limit.

g. Highest detection limit was 55.3 ppm, but the sample was below the detection limit.

## Table 2. Contaminant Comparison, Low-Volatile Metals (LVM) Group

| Low Volatile Metal[a] | Units | Range | |
|---|---|---|---|
| | | N-Viro Fuel® ®[b] | Coal[c] |
| Antimony (Sb)[d] | ppm | ND | ND - 10 |
| Arsenic (As) | ppm | ND - 29.4 | ND - 174 |
| Beryllium (Be) | ppm | ND - 1.46 | ND - 206 |
| Chromium (Cr) | ppm | 12.9 - 47.9 | ND - 168 |
| Cobalt (Co) | ppm | 3.27 - 4.53 | ND - 30 |
| Manganese (Mn) | ppm | 52.8 - 609 | ND - 512 |
| Nickel (Ni) | ppm | 14 - 110 | ND - 730 |
| Total LVMs [e] | ppm | <101 - 665 | ND - 767 |

**Notes:**

a. Low-volatile metals as identified in 40 CFR 63.1219(e)(4)—National Emission Standards for Hazardous Air Pollutants from Hazardous Waste Combustors.
b. Based on data provided by N-Viro International Corporation on January 18, 2013. Some LVMs included in these averages and totals were not detected. In these cases, the detection limit value was used to calculate averages and totals, and the results are denoted with a "<" symbol.
c. Data for coal from a combination of EPA data and literature sources, as presented in EPA document *Contaminant Concentrations in Traditional Fuels: Tables for Comparison, November 29, 2011,* available at www.epa.gov/epawaste/nonhaz/define/index.htm.
d. All samples were below detection limits.
e. The high and low ends of each individual metal's range do not necessarily add up to the total LVM range. This is because maximum and minimum concentrations for individual metals do not always come from the same sample.

## Table 3. Contaminant Comparison, Total Halogens Group

| Halogen | Units | Range | |
|---|---|---|---|
| | | N-Viro Fuel®[a] | Coal[b] |
| Chlorine | ppm | 2,329 - 7,551 | ND - 9,080 |
| Fluorine | ppm | 130.5 - 483.6 | ND - 178 |
| Total Halogens[c] | ppm | 2,489 - 7,728 | ND - 9,080 |

**Notes:**

a. Represents data provided by N-Viro International Corporation on January 18, 2013.
b. Data for coal from a combination of EPA data and literature sources, as presented in EPA document *Contaminant Concentrations in Traditional Fuels: Tables for Comparison, November 29, 2011,* available at www.epa.gov/epawaste/nonhaz/define/index.htm.
c. The high and low ends of each individual halogen's range do not necessarily add up to total halogens range. This is because maximum and minimum concentrations for individual halogens do not always come from the same sample.